1 574 409

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(19)

(54) BURNERS FOR GASEOUS FUELS

(71) We, RADIANT SUPERJET LIMITED, A British Company of Clapgate Lane, Woodgate, Birmingham, B32 3BP, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to burners for gaseous fuels and has as an object to provide such a burner in a convenient form.

A gas burner in accordance with the invention comprises an air flow passage and a streamlined body within said passage and at least one further streamline-shaped member in the passage whereby the cross-sectional area of air flow through said passage is first decreased relatively rapidly in the direction of air flow therethrough to a throat and then increased at a relatively slow rate, the streamlined body being formed with gas inlet ports opening on the surface of said body into the passage in the region of said throat, whereby, in use, air flow through said passage causes gas flow through said gas inlet ports to be induced by venturi action.

The invention is particularly applicable to gas burners and to dual fuel gas/oil burners. In this case the gas inlet ports are used for the introduction of the gaseous fuel and a separate oil spray head is located in the passage immediately downstream of the streamlined body. A flame holder plate may be arranged downstream of the oil spray head, the flame holder plate being of significantly less diameter than the passage. Where such a flame holder plate is employed there may be a gas pilot supply opening at the downstream side of said plate so that the gas pilot flame is stabilised by said plate.

The streamlined body may consist of a hollow central portion having a plurality of radially extending hollow arms, each arm being of streamlined section having a rounded upstream portion and a downstream portion tapering to a point, and the gas inlet ports being arranged in a row along each side of each arm. Said further streamline-shaped members may be inserts fitted in the passage in the spaces between said arms.

Alternatively, the streamlined body may be in the form of a hollow aerofoil extending diametrically across the passage and formed on opposite sides with said gas inlet ports. In this case said further streamline-shaped members may be in a pair of cheek members fitted in the passage. The cheek members may be formed with air by-pass slots.

As yet a further alternative the streamlined body may be of waisted tubular form through the centre of which the air is required to flow. The further streamline-shaped member may be a streamlined centre body fitted inside the streamlined member and this centre body may be axially adjustable.

In the accompanying drawings:—

Figure 1 is a fragmentary end elevation of an example of a burner in accordance with the invention;

Figure 2 is a section on line A—A in Figure 1;

Figure 3 is a somewhat diagrammatic section on line B—B in Figure 1;

Figure 4 is a view like Figure 2 of another example of the invention;

Figure 5 is a section on line C—C in Figure 4; and

Figure 6 is a section like Figure 2 of yet another example of the invention with various parts omitted for simplicity.

Referring firstly to Figures 1 to 3 the burner includes a draught tube 10 which in use is connected at one end to a fan and is left open at the other end for the burner flame to issue forth. The draught tube 10 is supported by a body 11 which also supports a gas supply pipe 12 on which there is mounted a hollow streamlined member 13. The member 13 consists of a hollow centre portion 14 and four hollow arms 15 projecting radially from the centre portion 14. The cross-section of an arm 15 is shown in Figure 3 from which it will be noted that the arms are of conventional aerofoil section having a rounded upstream

extremity and tapering to a point at the downstream extremity so as to minimise the drag induced by the arms in an air stream moving along the draught tube.

Four inserts 16 are mounted in the draught tube in the spaces between the arms 15 and are also of streamlined shape. These inserts 16 serve to coact with the arms 15 to form a venturi-type flow restriction in the draught tube such that the cross-sectional area in the tube available for air flow is reduced relatively rapidly to a throat at the axial position where the arms 15 are thickest and then increases relatively gradually back to its original unobstructed size. Thus air passing through the draught tube is accelerated to a maximum speed up to the throat and then decelerates again. In this way a considerable proportion of the static pressure lost by accelerating the air is recovered, but the static pressure at the throat is lower than that of the downstream end of the draught tube thus causing induction of gas into the air flow.

The arms 15 are formed on each side with a row of gas inlet ports 17 opening into the aforementioned throat and communicating with the gas pipe 12 via the interior of the member 13.

Mounted on the downstream end of the centre portion 14 of the member 13 is an oil spray nozzle 18 with which there is associated a conventional annular flame holder plate 19 which may be perforated or louvred in conventional manner. The plate 19 is, however, smaller in external diameter than the flame holder plate which would conventionally be used in a burner with the same sized draught tube. A gas pilot burner 20 is arranged to open downstream of the plate 19 to take advantage of the slowly moving air behind the plate 19 in use.

It is found that the burner described above can be operated with a stable flame on either gas or oil at a much higher energy rate than similarly sized burners utilising conventional bluff body type arrangements for creating a low pressure zone into which to introduce the gas. Since there is a good recovery of the air pressure downstream of the streamlined member 13 it is relatively simple to use the burner for firing into a boiler or furnace which creates a high back pressure, without the need for a gas pressure booster in the system. The burner allows a lower gas supply pressure to be used successfully, or alternatively smaller (and therefore less expensive) gas flow control gear can be employed for the same throughput.

It is also found that the burner is less susceptible to flame oscillations than many burners utilising full diameter flame holder plates.

If desired a pressure tapping may be taken from the throat by means of a pipe 21 opening on to the surface on one of the inserts 16. The pressure at this point will be indicative of the air flow through the burner and can be used to control fuel flow to the burner.

Turning now to Figures 4 and 5 the burner shown again includes a draught tube 110, and a body 111, but in this case the body and the draught tube together form the air flow passage. Fitted in the body 111 is a hollow streamlined member 112 extending diametrically across the air flow passage. The interior of this member communicates with a gas inlet 113. The member 112 is of aerofoil section like each of the arms 15 and is formed on each side with a row of gas inlet ports 114.

Also mounted in the body 111 are two cheek members 115 each of which is in the form of a shell of circular cross-section at each end but merging into a substantially rectangular section at its centre to provide a straight wall section 115*a* adjacent the member 114 and co-acting with the member 114 to create a venturi-type flow restrictor with characteristics similar to that described with reference to Figures 1 to 3. In this case, however, a pair of by-pass slots are formed in each cheek 115 respectively upstream and downstream of the throat of the venturi. These allow some air to by-pass the venturi. Again a pressure tapping may be taken from the throat via one of the cheeks.

The oil burner/gas pilot arrangement is the same as that described with reference to Figures 1 to 4.

In the arrangement shown in outline in Figure 6, the streamlined body is a waisted tube 210 which co-acts with a streamlined centre body 211 to create a venturi-type flow restrictor as before. An annular chamber between the body 212 and the tube 210 acts as a gas manifold to which a gas supply pipe (not shown) is connected. Gas inlet ports 213 are formed in the tube 210 at the venturi throat. The centre body 211 may be axially adjustable relative to the tube 210 to enable the performance of the burner to be optimised.

It will be appreciated that each of the above described burners may be intended for dual fuel use, in which case the gas inlet ports and the liquid fuel sprayer are both employed, or for gas only use, in which case the liquid fuel sprayer may be omitted.

WHAT WE CLAIM IS:—

1. A gas burner comprising an air flow passage and a streamlined body within said passage and at least one further streamline-shaped member in the passage whereby the cross-sectional area for air flow through said passage is first decreased relatively rapidly

in the direction of air flow therethrough to a throat and then increased at a relatively slow rate, the streamlined body being formed with gas inlet ports opening on the surface of said body into the passage in the region of said throat, whereby, in use, air flow through said passage causes gas flow through said gas inlet ports to be induced by venturi-action.

2. A burner as claimed in claim 1 in which the gas inlet ports are connected to a gas supply inlet, a separate liquid fuel spray head being located in the passage immediately downstream of the streamlined body.

3. A burner as claimed in claim 2 further comprising a flame holder plate supported downstream of the spray head, the flame holder plate being of significantly less diameter than the passage.

4. A burner as claimed in claim 3 further comprising a gas pilot supply opening at the downstream side of said plate.

5. A burner as claimed in any preceding claim in which the streamlined body consists of a hollow central portion having a plurality of radially extending hollow arms each arm being of streamlined section having a rounded upstream portion and a downstream portion tapering to a point, and the fuel inlet ports being arranged in a row along each side of each arm.

6. A burner as claimed in claim 5 in which said further streamline-shaped members comprise a plurality of inserts fitted in the passage in the spaces between the arms.

7. A burner as claimed in any of claims 1 to 4 in which the streamlined body comprises a hollow aerofoil extending diametrically across the passage and formed on opposite sides with said fuel inlet ports.

8. A burner as claimed in claim 7 in which said further streamline-shaped member comprises a pair of cheek members fitted in the passage.

9. A burner as claimed in claim 8 in which the cheek members are formed with air by-pass slots.

10. A burner as claimed in any of claims 1 to 4 in which the streamlined body is of waisted tubular form through the centre of which the air is caused to flow in use.

11. A burner as claimed in claim 10 in which said further streamline-shaped member comprise a streamlined centre body fitted inside the streamlined body.

12. A burner as claimed in claim 11 in which the centre body is axially adjustable.

13. A fluid fuel burner substantially as hereinbefore described with reference to and as shown in Figures 1 to 3 of the accompanying drawings.

14. A fluid fuel burner substantially as hereinbefore described with reference to and as shown in Figures 4 and 5 of the accompanying drawings.

15. A fluid fuel burner substantially as hereinbefore described with reference to and as shown in Figure 6 of the accompanying drawings.

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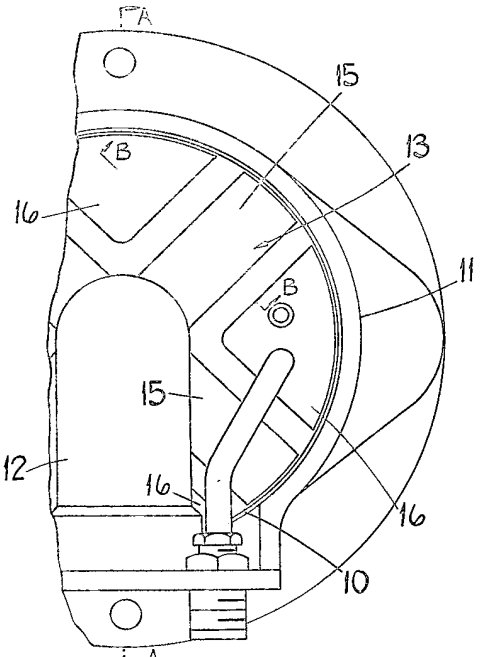
1574409 COMPLETE SPECIFICATION
3 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

FIG.1.



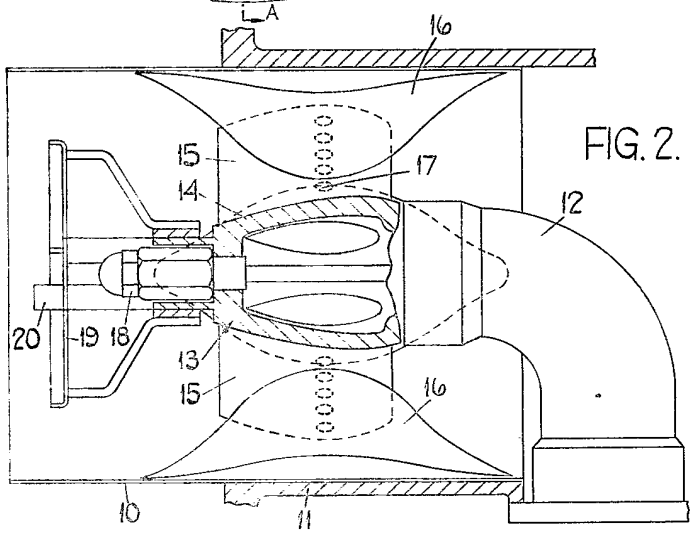


FIG. 2.

FIG. 3.

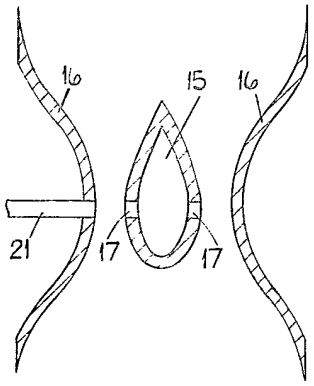


FIG. 4.

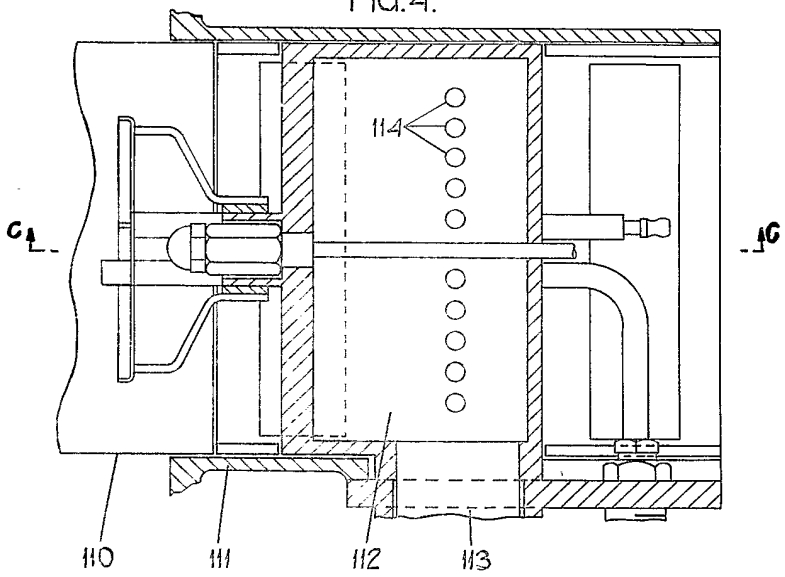


FIG. 5.

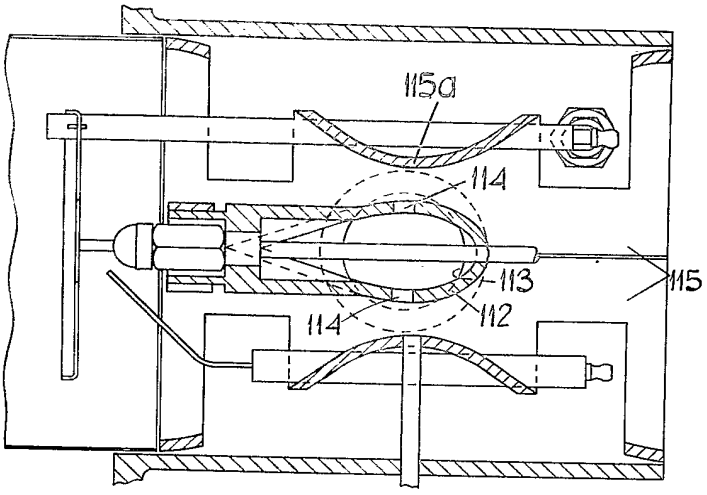
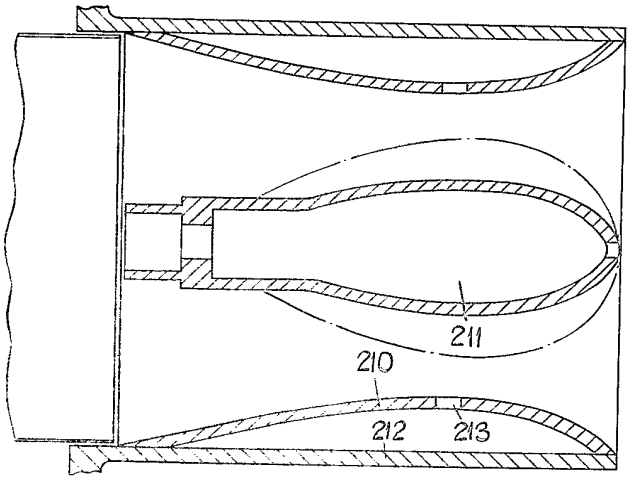


FIG. 6.



DERWENT-ACC-NO: 1980-H7030C

DERWENT-WEEK: 198036

TITLE: Gas burner with streamlined body has gas induced through ports in body by venturi action caused by flow of air

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PATENT-ASSIGNEE: RADIANT SUPERJET[RADIN]

PATENT-FAMILY:

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CIPS	F23D17/00 20060101

ABSTRACTED-PUB-NO: GB 1574409 A

BASIC-ABSTRACT:

The gas burner consists of a streamlined body (13) in an air flow passage with an insert (16) in the passage. The cross-sectional area is first decreased rapidly in the direction of flow to a throat and then increased at a slower rate.

The body has gas inlet parts opening on its surface into the passage in the region of the throat. Air flow causes gas to be induced through the parts by venturi action. A liquid fuel spray head (18) may be located in the passage immediately downstream of the body.

TITLE-TERMS: GAS BURNER STREAMLINED BODY INDUCE THROUGH PORT VENTURI ACTION CAUSE FLOW AIR

DERWENT-CLASS: Q73